



## Basic Earth Sciences

Basic research is important for maintaining the vitality of the EES research staff and for developing new ideas and techniques for use in applied projects, both in our division and elsewhere. Our geophysical projects include studying the nonlinear properties of rocks and other earth materials; investigating the conductivity of the earth and earth materials; and developing advanced wave-equation methods for seismic imaging and modeling, including studying the effects of random heterogeneity on the character of regional seismic waveforms. Our geological research covers a range of topics, including new techniques for interpreting x-ray diffraction data on disordered clay minerals (which are important for a variety of civil engineering and waste disposal applications) and geothermal energy exploration. We are also addressing such global issues as the evolutionary history of the human species (by studying the fossil record in east Africa) and new theories for the origin of life in our solar system. All of these research topics contribute to the intellectual vitality of EES Division.

There are several good examples of how our research has been applied in other fields. Our new ideas on the nonlinear properties of rocks have been applied to nondestructive testing of materials, including characterization of automotive parts and weapons components and nonlinear characterization of strong ground shaking during large earthquakes. Our work in advanced wave-equation methods for seismic modeling and imaging has led to new methods for seismic imaging that are now being applied by the petroleum industry.